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DETAILED ACTION

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 04052404

Application Number: 09/435,748
Filing Date: November 08, 1999
Appellant(s): BUCKLEY ET AL.

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Mr. Peter S. Dardi
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 7/28/2004.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct. The amendment after final rejection filed on 12/15/2003 has not been entered.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

The rejection of claims 29-44, 52-54, and 58-89 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7). The statement does not provide reasons in support thereof. Note that 37 CFR 1.192(c)(7) states that "Merely pointing out differences in what the claims cover is not an argument as to why the claims are separately patentable."

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

6,033,805	DANSUI	3-2000
5,571,638	SATOH	11-1996
6,165,642	KAWAKAMI	12-2000
6,037,095	MIYASAKA	3/2000

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Rejections under 35 U.S.C. 112, first paragraph:

Claims 29-44, 52-54, and 58-89 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.

The claim(s) contains subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The amendment filed 4/21/2003 introduces new matter into the disclosure. The added material which is not supported by the original disclosure is as follows:

In claims 29-44, 52-54, 58-83 and 85, the average electrode thickness has been amended to be less than about 9.5 microns. There is no support in the specification for this specific point. The applicant has provided pages 50-51 as support for the change in the amendment; however, no support is found for "less than about 9.5 microns." In claims 84-89, there is no support for a

current collector average thickness of less than about 4.5 microns. There is no support in the specification for this specific point. The applicant has provided pages 50-51 as support for the change in the amendment; however, no support is found for "less than about 4.5 microns."

Rejections under 35 U.S.C. 112, second paragraph:

Claims 29-44, 52-54, 58-89 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The instant claims use the phrase "less than about." This phrase is indefinite as "less than" defines a lower limit, while the term "about" contradicts the value of the lower limit. As shown in the MPEP, section 2173.05(b), the phrase "at least about" is held as indefinite. Regarding claims 36, 38, 66 and 68, the word "derivative" renders the claim(s) indefinite because the claim(s) include(s) elements not actually disclosed (those encompassed by "derivatives"), thereby rendering the scope of the claim(s) unascertainable. Based on the specification, which includes various metal oxides, one of ordinary skill in the art would be unable to ascertain the scope encompassed by the term derivatives with regard to the electrode composition. The identity of the derivations of the electrode material is unclear and includes elements not actually disclosed. Thus, the scope of the claim(s) is unascertainable. As an example, lithium cobalt oxide is a claimed formula, however, lithium cobalt manganese oxide, which may be considered a derivative, is not disclosed. The word derivative, when read in light of the specification, renders the claim indefinite.

Rejections under 35 U.S.C. 102:

Claims 29-33, 39, 53, 58-63, 69, 76, 84, 85, and 88 rejected under 35 U.S.C. 102(e) as being anticipated by Dansui et al. (US 6,033,805.)

Dansui et al. (US 6,033,805) teaches a battery comprising a positive electrode, a negative electrode and a polymer separator between the positive and negative electrodes. An electrode has an average thickness of less than about 9.5 microns, μm. For example, column 3, lines 5-10 shows an electrode layer of 10-60 microns on a collector foil and claim 16 shows a layer of 10-60 microns on each side of the foil. Using the lower limit, 10 μm is interpreted to be "less than about" 9.5 μm as 9.5 μm is about 10 μm. The electrode active material comprises a powder of cobalt hydroxide electroactive particles having an average diameter of less than about 200 nm (see example 2 and claim 15.) The current collectors and separators have a thickness of about 10 μm (see example 1.) The active material may be the positive or negative electrode depending on the state of charge of the battery. The active material is mixed with a binder and conductive particles and is attached to a current collector (see the examples.)

With regard to claims 84, 85, and 88, Dansui et al. (US 6,033,805) teaches a battery comprising a positive electrode, a negative electrode and a polymer separator between the positive and negative electrodes. The current collectors and separators have a thickness of about 5-20 microns (see col. 3, lines 1-10 and 10 μm in example 1.) A value of 5 microns is considered to be "less than about" 4.5 microns due to the limitation "about." The active material may be the positive or negative electrode depending on the state of charge of the battery. The active material is mixed with a binder and conductive particles and is attached to a current collector (see the examples.) Thus, the claims are anticipated.

Rejections under 35 U.S.C. 103:

-Claims 34, 35, 37, 38, 41-44, 52, 54, 64, 65, 67, 68, 71-75, and 77 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dansui et al. (US 6,033,805) in view of Satoh et al. (US 5,571,638.)

Dansui et al. (US 6,033,805) teaches battery comprising a positive electrode, a negative electrode and a polymer separator between the positive and negative electrodes. The electrode has an average thickness of less than about 10 microns, μm. For example, column 3, lines 5-10 shows an electrode layer of 10-60 microns on a collector foil, and claim 16 shows a layer of 10-60 microns on each side of the foil. Using the lower limit, 10 μm on one or both sides of the foil (~20μm) is interpreted to be less than about 9.5 μm. The active material comprises a powder of cobalt hydroxide electroactive particles having an average diameter of less than about 200 nm (see example 2 and claim 15.) The current collectors and separators have a thickness of about 10 microns (see example 1.) The active material may be the positive or negative electrode depending on the state of charge of the battery. The active material is mixed with a binder and conductive particles, and is attached to a current collector (see the examples.)

Dansui et al. (US 6,033,805) does not teach the specific electrode materials including a lithium metal, alloy or lithium intercalation negative electrode, a metal oxide positive electrode or current collectors as described in the dependent claims of this rejection. Satoh et al. (US 5,571,638), however, teaches a battery comprising a positive electrode, a negative electrode and a polymer separator between the positive and negative electrodes. The active material comprises a powder comprises lithium transition metal oxide electroactive particles having an average

diameter of less than about 500 nm (see example 2 and claim 15), a conductive powder and binder (see claims 1-10.) The anode material is a carbon powder with a size ranging from 10 nm to 50 micron (see the paragraph bridging cols. 3-4.) Current collectors of stainless steel, copper and aluminum are noted in col. 7, lines 55+. Polymer separators having a thickness of about 10 microns are noted (see example 8 and col. 8, lines 1-45.) The active material may be the positive or negative electrode depending on the state of charge of the battery. The active material is mixed with a binder and conductive particles, and is attached to a current collector (see the examples.)

It would be obvious to one skilled in the art at the time the invention was made to prepare a battery with materials of nanometer sized particles as these methods are taught in the art as described, and further, it would be obvious to prepare electrodes with various thicknesses as the small particle sizes will allow for electrodes with increased surface area and an average thickness of less than about 10 microns, as taught in Dansui et al. (US 6,033,805.) One of ordinary skill in the art would have the knowledge to use the electrode materials of Satoh et al. (US 5,571,638) in a thin electrode battery as taught Dansui et al. (US 6,033,805) as it is clear that electrodes can be prepared with an average thickness of less than about 10 microns and the materials will promote charge transfer into a useable current as noted in the references. In addition, one of ordinary skill in the art would have the knowledge to incorporate the thickness of the electrodes of Dansui et al. (US 6,033,805) into the thin battery of Satoh et al. (US 5,571,638) as the small particles will allow for the production of a thin electrode with binders and conductive particles. The use of various current collectors would be obvious, as the materials are well known in the art to conduct current from an electrode material.

Dansui et al. (US 6,033,805) and Satoh et al. (US 5,571,638) are silent to the surface roughness of the separator, however, Satoh et al. (US 5,571,638) teaches the surface roughness of the current collectors to be 0.1-10 microns to increase bonding. It would be obvious to one skilled in the art at the time the invention was made to have materials in the electrode assembly with a surface roughness of 0.1-10 microns to increase the bonding of the materials. The current collector is bound to the active material in the same manner the separator is bound to the active material on the opposite side of active material. One of ordinary skill in the art would recognize that a surface roughness of 0.1-10 microns would increase the bonding and adherence of the materials in the electrode assembly, as taught by the reference.

-Claims 34-43, 53, 64-68, 70-73, 76 and 77 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dansui et al. (US 6,033,805) in view of Kawakami et al. (US 6,165,642.)

Dansui et al. (US 6,033,805) teaches a battery comprising a positive electrode, a negative electrode and a polymer separator between the positive and negative electrodes as previously described. Dansui et al. (US 6,033,805) does not teach the specific electrode materials including a lithium metal, alloy or lithium intercalation negative electrode, a metal oxide positive electrode or current collectors as described in the dependent claims of this rejection.

Kawakami et al. (US 6,165,642) teaches a rechargeable lithium battery comprising a positive electrode, a negative electrode and a polymer separator between the positive and negative electrodes. The electrode includes an active material comprising a powder of lithium transition metal oxide electroactive particles having an average diameter of less than about 500 nm (see examples 2-4 and claim 1), a conductive powder and binder (see claims 1-18 and

examples 1-4.) The size distribution of the active material is between 0.5 to 50 nm in examples 2-4. The anode material may be a transition metal oxide, lithium material or a carbon powder (see col. 9.) Solid and gel electrolytes may be used in the cell (see col. 10.) Current collectors of stainless steel, copper and aluminum are noted in col. 9 and the examples. Polymer separators are noted in the examples. The active material may be the positive or negative electrode depending on the state of charge of the battery. The active material is mixed with conductive particles and attached to a current collector (see the examples.)

It would be obvious to one skilled in the art at the time the invention was made to prepare the claimed materials as nanometer sized particles as these methods are taught in the art as described. Further, it would be obvious to prepare electrodes with various thicknesses as the small particle sizes will permit electrodes with an average thickness of less than about 10 microns, as taught in Dansui et al. (US 6,033,805.) The motivation to make smaller electrodes is found in Dansui as the materials can be used to make smaller batteries. One of ordinary skill in the art would have the knowledge to use the electrode materials of Kawakami et al. (US 6,165,642) in a thin electrode battery as taught by Dansui et al. (US 6,033,805) as it is clear that electrodes can be prepared with an average thickness of less than about 10 microns. In addition, one of ordinary skill in the art would have the knowledge to incorporate the thickness of the electrodes of Dansui et al. (US 6,033,805) into the thin battery of Kawakami et al. (US 6,165,642) as the small particles will allow for the production of a thin electrode with binders and conductive particles. The use of various current collectors would be obvious as each are well known in the art to conduct current from an electrode material.

-Claims 36 and 66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dansui et al. (US 6,033,805) in view of Kawakami et al. (US 6,165,642) as applied above, and further in view of Miyasaka et al. (US 6,037,095.)

The teachings of Dansui et al. (US 6,033,805) and Kawakami et al. (US 6,165,642) have been presented. With regard to claims 36 and 66, Kawakami et al. (US 6,165,642) teaches the anode material may be a transition metal oxide, lithium material or a carbon powder. Kawakami et al. (US 6,165,642) does not specifically teach tin oxide as an anode material, however one of ordinary skill in the art would recognize that tin oxide is a well known transition metal oxide used as an anode in lithium secondary cells. For example, Miyasaka et al. (US 6,037,095) teaches a lithium ion secondary battery with a tin oxide anode or negative electrode (see claim 2.) It would be obvious to one skilled in the art at the time the invention was made to use tin oxide as the transition metal oxide anode material of Kawakami et al. (US 6,165,642) as tin oxide will allow for the equivalent transfer of ions in the battery as the transition metal oxides of Kawakami.

-Claims 78-83, and 86-89 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dansui et al. (US 6,033,805.)

Dansui et al. (US 6,033,805) teaches a battery comprising a positive electrode, a negative electrode and a polymer separator between the positive and negative electrodes. The electrode has an average thickness of less than about 10 microns. For example, column 3, lines 5-10 shows an electrode layer of 10-60 microns on a collector foil, and claim 16 shows a layer of 10-60 microns on each side of the foil. Using the lower limit, 10 μm on one or both sides of the foil (~20μm) is interpreted to be "less than about" 9.5 μm. The active material comprises a powder

comprises cobalt hydroxide electroactive particles having an average diameter of less than about 200 nm (see example 2 and claim 15.) The current collectors and separators have a thickness of about 10 microns (see example 1.) The active material may be the positive or negative electrode depending on the state of charge of the battery. The active material is mixed with a binder and conductive particles, and is attached to a current collector (see the examples.)

Dansui et al. (US 6,033,805) does not teach the electrode to have an average thickness of less than about 5 microns, from 250 nm to 2.5 microns or from 300 nm to about 1 micron. It would be obvious to one of ordinary skill in the art at the time the invention was made to alter the thickness of the electrode as one of ordinary skill in the art would understand that adding more or less active material to an electrode will increase/decrease the capacity of the battery. One of ordinary skill in the art would alter the amount and therefore the size of the electrode in order to achieve a desired capacity for a battery.

Further, the Dansui et al. (US 6,033,805) reference does not teach current collectors to have an average thickness of less than about 2.5 microns, or from 0.25 to about 1 micron. It would be obvious to one of ordinary skill in the art at the time the invention was made to alter the thickness of the electrode current collector as one of ordinary skill in the art would understand the relationship between the size of the current collector and the conduction of the electrons through the current collector to and from the electrode. One of ordinary skill would understand that decreasing the size of the current collector would allow for the inclusion of more active material in a battery electrode and therefore a higher capacity. Further, one of ordinary skill in the art would recognize that electronic conduction through the current collector would require access to the collector in order from the active material in order to conduct electrons to

and from the electrode. The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

(11) Response to Arguments

A) INDEFINITENESS REJECTION

The applicant states that the term “about” is interpreted in a claim based on the facts of the case. The applicant then argues that the term ‘about” reflects the natural imprecision of variables with approximate cut off values at a particular precision. The instant claims use the phrase “less than about.” The applicant does not address the use of the phrase “less than about.” This phrase is indefinite as “less than” defines an upper limit, while the term “about” contradicts the value of the limit. As shown in the MPEP, section 2173.05(b), section (a), the phrase “at least about” is held as indefinite. The same reasoning is applied to the phrase, “less than about.” The applicant recognizes the courts have upheld when ‘the meaning of claims is in doubt, especially when … there is close art, they are properly declared invalid.” Amgen Inc. v. Chugai Pharmaceutical Co. Ltd., 18 USPQ2d 1016, 1031 (Fed. Cir. 1991.) As the difference of the electrode thickness in the claim as compared to the art is 0.5 μm, the art is considered close prior art and the rejection is deemed proper. This argument is noted for the current collector thicknesses.

With respect to the term “derivative,” the applicant argues that all derivatives are within the boundaries of the claims and that all one of ordinary skill in the art must be able to do is evaluate whether or not the composition is a derivative. The MPEP states that there are two separate requirements for claims under 35 U.S.C. 112, second paragraph. The first is that the

claims must set forth the subject matter that applicants regard as their invention. The second is that the claims must particularly point out and distinctly define the metes and bounds of the subject matter that will be protected by the patent grant (MPEP 2171.) The word "derivatives" in the rejected claims do not meet this second criterion. The MPEP further states that, "the meaning of every term used in a claim should be apparent from the prior art or the specification," (MPEP 2173.05 (a)) and that "definiteness of the claim language must be analyzed in light of the contents of the original application or disclosure, the teachings of the prior art, and the claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made; and that if the scope of the invention sought to be patented cannot be determined from the language of the claims with a reasonable degree of certainty, a rejection of the claims under 35 U.S.C. 112, second paragraph is appropriate," (MPEP 2173.02.)

The term "derivatives" is used in the claims to define very different electrode active materials. For example, claim 38 cites nine general compositions. These compositions are general and do not cite specific formulae. These compositions include molecules that are not limited to a specific molecular formula and encompass different concentrations of each atom. These materials are considered to be definite in scope. *However, one possessing the ordinary level of skill in the pertinent art at the time the invention was made could not determine the scope of the invention with regard to* <u>*derivatives*</u> *of these materials with a reasonable degree of certainty.* When the definiteness of the claim language is analyzed in light of the contents of the original application or disclosure, one determines that the disclosure merely repeats that the composition may include derivatives thereof. When the definiteness of the claim language is analyzed in light of the teachings of the prior art by one possessing the ordinary level of skill in

the pertinent art at the time the invention was made, one determines that the scope cannot be determined. The prior art describes active materials including the atomic and molecular structures of the claim: Using lithium cobalt oxide as an example, compounds of cobalt, cobalt oxide, lithium nickel cobalt oxide and lithium cobalt oxides substitutes with various metals are all noted in the art (see for example, Kamauchi, US 5,614,334.) Lithium cobalt phosphates are noted which may or may not be considered a derivative of the oxide of this example. Calcium cobalt oxides are taught which may or may not be considered a derivative of the oxide of this example (Ovshinsky, US 6,017,655.) Mayer (US 5,783,333) teaches $Li_xNi_yCo_zAl_nMn_{n1}O_2$ and $LiNi_{0.60}Co_{0.15}Al_{0.10}Cr_{0.10}Mn_{0.05}O_2$, which may or may not be considered a derivative of claim 38. A large number of substitutions and additions to these general compositions are taught that may or may not be considered derivatives of these materials and one of ordinary skill in the art at the time the invention was made would not be able to determine the scope of the invention with regard to <u>derivatives</u> of these materials with a reasonable degree of certainty.

B. WRITTEN DESCRIPTION REUIREMENT/NEW MATTER

The applicant argues that the specification supports an average thickness of less than about 10 microns and, therefore, the specification would without a doubt include an average thickness of 9.5 microns or "any other average thickness of less than 10 microns."

The applicant has narrowed the claimed range in order to overcome the art of record, which teaches an electrode thickness range with an end point of 10 microns. The electrode thickness range of "less than about 10 microns" is supported by the original disclosure; however, the specification does not offer a range or point including the end point of less than about 9.5

microns. The point 9.5 microns is not supported anywhere in the reference. In the dependent claims, the range has been narrowed from less than about 5 microns to less than about 4.5 microns. Again, the application offers no support for a thickness range with 4.5 microns as an end point. The point 4.5 microns is not supported anywhere in the reference. While the original specification does define a range of less than about 5 microns and specific points for 5 and 1 microns, (original claims 20 and 21 and page 50 of the specification), the specification does not teach ranges with end points of either 9.5 microns or 4.5 microns. If the term "about" is considered to have a value to the same degree of length at both points 9.5 and 10 microns, inserting the unsupported point of 9.5 microns to the claims adds 0.5 microns to the value defining the degree of length encompassed by the term "about."

C. REJECTION UNDER 35 U.S.C. 102(e)

With regard to the claims rejected under 35 U.S.C. 102(e) as being anticipated by Dansui et al. (US 6,033,805,) the applicant argues that the rejection is based on the improper interpretation of the claims by the examiner based on the assertion that an electrode thickness of 10 microns is interpreted to be in the range of "less than about 9.5 microns." In addition, the applicant argues that a second rejection is improper based on the improper interpretation of the claims by the examiner on the assertion that an electrode current collector thickness of 5 microns is interpreted to be in the range of "less than about 4.5 microns."

The applicant has included the word 'about" in the claim, using the phrase "less than about 9.5 microns." The claims are to be given their broadest, reasonable interpretation upon examination (MPEP 2111.) The use of the word "about" does not define a strict limit of 9.5

microns. The interpretation of the claims to include the point of 10 microns as "about 9.5" microns is considered reasonable by the examiner just as the interpretation of the claims to include the point of 5 microns as "about 4.5" microns is reasonable for the current collector thickness. Based on the interpretation of claims that has been presented on the record, the rejection of the claims is proper. With regard to claim 88, the thickness of 5 microns for the current collector is interpreted to be in the range of "less than about 2.5 microns" based on the same reasoning and interpretation of the word "about." As this point is further away from 5 microns as compared with the point of 4.5 microns, a rejection of claim 88 under 35 U.S.C. 103 has also been applied.

D. REJECTIONS UNDER 35 U.S.C. 103(a)

With regard to the claims rejected under 35 U.S.C. 103(a) as being unpatentable over Dansui et al. (US 6,033,805,) the applicant argues that the reference teaches away from the assessment by the examiner that it would be obvious to alter the thickness of the electrode and the current collector. The applicant uses the lower limit of the thickness ranges taught in the reference to suggest that one of ordinary skill in the art would not modify the thickness to less than the cited range. The examiner disagrees. One of ordinary skill in the art would adjust the thickness of the electrode simply to increase or decrease the capacity of the battery, as it is well known that adding more or less active material to an electrode will increase or decrease the capacity of the battery. The active material comprises a powder of cobalt hydroxide electroactive particles having an average diameter as small as 200 nm. The active material further includes a conductive agent with a thickness of less than 1 micron in an amount of about

1% of the electroactive particles. The applicant has noted in arguments that a minimum amount of conductive agent is used in the electrode of Dansui. This acknowledgement further supports the position that the electrode may be made more thin because the less conductive agent that is needed for conduction from the electrode, the more thin the electrode may be constructed while having the same capacity. Using active materials of small particle sizes, as noted in Dansui, will allow the skilled artesian to form electrodes with a thickness on an order of the size of these particles. The capacity of the battery is based on the amount of active material. If the skilled artesian desires to construct a battery with a higher capacity, the artesian will use more active material. If the skilled artesian desires to construct a battery with less capacity, the artesian will use less active material. The applicant notes that the battery capacity may also depend on the area of the electrode and the configuration of the battery. This is not disputed, however, it supports the examiner's arguments that the skilled artesian would understand that the capacity is related to the amount of active material. The ordinary skilled artesian understands that an electrode with a larger area and a lesser thickness will provide the same capacity as an electrode with a proportionately smaller area and greater thickness as long as the electroactive material is conducted. The focus of the Dansui patent is to improve the capacity of the electrode be decreasing the amount of conductive material while maintaining the same conductivity, which allows for more active material in an electrode when the dimensions are equivalent (i.e. a higher amount of active material, and therefore capacity, in the same unit area.)

The Dansui et al. (US 6,033,805) reference does not teach current collectors to have an average thickness of less than about 2.5 microns, or from 0.25 to about 1 micron, however, one of ordinary skill in the art at the time the invention was made would understand that decreasing

the size of the current collector would allow for the inclusion of more active material in a battery electrode and therefore a higher capacity. One of ordinary skill in the art would understand the relationship between the size of the current collector and the conduction of the electrons through the current collector to and from the electrode. Further, one of ordinary skill in the art would recognize that electronic conduction through the current collector would require access to the collector from the active material in order to conduct electrons to and from the electrode. The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

Changes in size, proportion and shape have been held to be obvious over the prior art when the only difference between the prior art and the claims are a recitation of the relative dimensions of the claimed device (MPEP 2144.04(d).) The only claimed difference between the prior art and the instant claims are the smaller thickness while using materials that are on the same scale as the art. While the smaller dimensions will have effects such as lowering the battery capacity, these are not unexpected, as one of ordinary skill in the art would expect the thinner electrodes to have less active material simply due to the decrease in size.

With regard to the claims rejected under 35 U.S.C. 103(a) as being unpatentable over Dansui et al. (US 6,033,805) in view of Satoh et al. (US 5,571,638,) the applicant argues that the Satoh patent does not teach, suggest, or motivate an electrode with a thickness of less than about 9.5 microns. This feature is found in the Dansui reference as noted in the arguments above under 35 U.S.C. 102(e).

With regard to the applicant's argument that the Satoh patent doesn't support the use of electroactive particles having a particle diameter of less than about 100 nm, the graphite carbon

of the Satoh reference has a particle size of less than 100 nm and may be used in the electrode of Dansui as the electroactive conductive material. Although the batteries are different, the material of the Satoh reference may be used in the electrode of Dansui as graphite is commonly used in the art to electrically conduct electrons in an electrode.

With regard to the applicant's argument that the Satoh patent doesn't disclose surface roughness or particle uniformity, the Satoh et al. (US 5,571,638) reference teaches the surface roughness of the current collectors to be 0.1-10 microns to increase bonding. This degree of surface roughness is in the range of the claimed invention. The current collector is bound to the active material in the same manner the separator is bound to the active material on the opposite side of active material. One of ordinary skill in the art would recognize that a surface roughness of 0.1-10 microns would increase the adherence of the electrode material and the separator in the electrode assembly as taught in the art. Although the materials and the layers are separate, the active material is adjacent to both the collector and the separator and this degree of surface roughness would be expected to hold the layer together in the assembly. The applicant has not provided arguments during the prosecution with regard to the particle uniformity. As the prior art teaches particles of the same average size, the effects of these materials would be considered equivalent. One of ordinary skill in the art would find it obvious to use the average sized particles as taught in the prior art as these particle would be understood to give the results provided in the reference for producing electrical current. The applicant has offered no unexpected results for having uniform particles.

With regard to the claims rejected under 35 U.S.C. 103(a) as being unpatentable over Dansui et al. (US 6,033,805) in view of Kawakami et al. (US 6,165,642,) the applicant argues

that the Kawakami patent does not teach, suggest, or motivate an electrode with a thickness of less than about 9.5 microns. This feature is found in the Dansui reference as noted in the arguments above under 35 U.S.C. 102(e). With regard to the applicant's assertion that the examiner incorrectly states the size distribution, the applicant is correct. The number were mistakenly added for the pore sizes however, the particle sizes are less than 100 nm as shown in the rejection, as noted in claim 1 and the examples (primary particle sizes of 5 nm to 300 nm in claim 1.) For clarity of the record, the size distribution is not claimed in the instant invention. The combination of the reference is permitted as they are to the analogous art of batteries. The references are used to show that electrodes with active materials of small particles may be used to form thin electrodes. The small particle sizes are known for both types of batteries and the references teach that materials are taught in the art with small particle sizes for transferring charge. Gel electrolytes and separators imbibed with electrolyte are formed between the electrodes and inherently act as a battery separator. The applicant has not provided arguments during the prosecution with regard to the particle uniformity. As the prior art teaches particles of the same average size, the effects of these materials would be considered equivalent. One of ordinary skill in the art would find it obvious to use the average sized particles as taught in the prior art as these particle would be understood to give the results provided in the reference for producing electrical current. The applicant has offered no unexpected results for having uniform particles.

With regard to the claims rejected under 35 U.S.C. 103(a) as being unpatentable over Dansui et al. (US 6,033,805) in view of Kawakami et al. (US 6,165,642) as applied above, and further in view of Miyasaka et al. (US 6,037,095,) the applicant argues that the Kawakami patent

does not teach, suggest, or motivate an electrode with a thickness of less than about 9.5 microns. This feature is found in the Dansui reference as noted in the arguments above under 35 U.S.C. 102(e). The supporting reference teaches tin oxide. Tin oxide is a well-known anode material in the batteries cited. The combination of the references is permitted as they are to the analogous art of batteries. The references are used to show that electrodes with active materials of small particles may be used to form thin electrodes. The small particle sizes are known for both types of batteries and the reference teach that materials are known in the art with small particle sizes.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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11/8/04

MR
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Conferees
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